CLAIMS:

1. A method of determining at least one characteristic of an earth formation surrounding a borehole using a rotating logging tool, the logging tool having at least one emitter for emitting energy into the earth formation and at least one detector for detecting energy reflected from the earth formation, the method comprising:

detecting energy during a plurality of sample periods with the detector to produce a plurality of samples corresponding to the sample periods, wherein the duration of each sample period is shorter than one half of the time required for the tool to complete a rotation;

measuring the azimuthal angle of the detector in at least one sample period;

measuring the standoff of the detector from the wall of the borehole in at least one sample period;

sorting the samples into groups, each group representative of the azimuthal sector of the borehole from which the sample was detected;

within a group, mathematically weighting each of the samples according to standoff;

within a group, mathematically summing the weighted samples to achieve a weighted sample total for a sector;

within a group, dividing the weighted sample total by the total duration of sample

periods in the group to determine an detection rate for the sector; and

transforming the detection rate for at least one sector into a representation of at least one formation characteristic.

2. The method of claim 1 further comprising transforming the detection rate for at least two of the sectors into the same formation characteristic to produce an image of the borehole with respect to the particular formation characteristic.

3. The method of claim 1 further comprising transforming the detection rate for one or more sectors into a representation of a representative formation characteristic of the borehole.

4. The method of claim 1 wherein the emitter emits gamma radiation and the detectors detect counts of back-scattered gamma radiation.

5. The method of claim 4 wherein the at least one formation characteristic comprises density.

6. The method of claim 4 wherein the at least one formation characteristic comprises a lithology indicator.

7. The method of claim 1 wherein the borehole is divided into sixteen azimuthal sectors.

8. The method of claim 1 further comprising deriving a representation of a representative characteristic for at least two portions of the circumference of the borehole.

9. The method of claim 1 wherein the duration of each sample period is shorter than the time that the detector is in the azimuthal sector in one rotation of the tool.

10. The method of claim 1 wherein the energy is detected in a first energy interval and a second energy interval during the sample periods;

wherein the steps of mathematically weighting each of the samples according to standoff, mathematically summing the weighted samples, and dividing the weighted sample total by the total duration of the sample periods are performed with respect to the first energy interval and then with respect to the second energy interval; and

wherein transforming the detection rate for at least one sector comprises transforming the detection rate for at least one energy interval for at least one sector into a representation of at least one formation characteristic.

11. A method of determining at least one characteristic of an earth formation surrounding a borehole using a rotating logging tool, the logging tool having at least one emitter for emitting energy into the earth formation and at least one detector for detecting energy reflected from the earth formation, comprising:

detecting energy during a plurality of sample periods with the detector to produce a plurality of samples corresponding with the sample periods, wherein the duration of each sample period is shorter than one half of the time required for the tool to complete a rotation;

measuring the azimuthal angle of the detector in at least one sample period;

sorting the samples into a plurality of groups, each group representing the azimuthal sector of the borehole from which each sample was detected;

within a group, calculating the mean of the samples;

within a group, calculating a theoretical standard deviation of the samples;

within a group, calculating an actual standard deviation of the samples;

within a group, mathematically weighting each of the samples according to the deviation of the sample from the mean and mathematically summing the weighted samples to produce a weighted sample total for a sector;

within a group, dividing the weighted sample total by the total duration of sample periods in the group to determine an detection rate for the sector; and

transforming the detection rate for at least one sector into a representation of at least one formation characteristic.

12. The method of claim 11 further comprising:

within a group, if the ratio of the actual standard deviation to the theoretical standard deviation is below a given value, mathematically summing the samples to achieve a sample total for a sector; and

within a group, dividing the weighted sample total by the total duration of sample periods in the group to determine a count rate for the sector.

13. The method of claim 11 further comprising transforming the detection rate for at least two of the sectors into the same formation characteristic to produce an image of the borehole with respect to the formation characteristic.

14. The method of claim 11 further comprising transforming the detection rate for one or more sectors into a representative formation characteristic of the borehole.

15. The method of claim 11 wherein the emitter emits gamma radiation and the detectors detect counts of back-scattered gamma radiation.

16. The method of claim 15 wherein the at least one formation characteristic comprises density.

17. The method of claim 15 wherein the at least one formation characteristic comprises a lithology indicator.

18. The method of claim 11 wherein the step of sorting the samples into a plurality of groups comprises sorting the samples into sixteen groups.

19. The method of claim 11 wherein the duration of each sample period is shorter than the time that the detector is in the azimuthal sector in one rotation of the tool.

20. The method of claim 11 wherein the energy is detected in a first energy interval and a second energy interval during the sample periods;

wherein the steps of mathematically weighting each of the samples according to standoff, mathematically summing the weighted samples, and dividing the weighted sample total by the total duration of the sample periods are performed with respect to the first energy interval and then with respect to the second energy interval; and

wherein transforming the detection rate for at least one sector comprises transforming the detection rate for at least one energy interval for at least one sector into a representation of at least one formation characteristic.